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(54) INPUT DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an input device capable of sending feed back the completion of input operation.
SOLUTION: When a key top 101 is pushed, an input detecting part 102 detects pushing force and outputs a detecting signal S1. A controller 104 receives the detecting signal S1 as an input signal and outputs a driving signal S2. A driving part 103 vibrates the key top 101 with the driving signal S2. A worker feels the vibration of the key top 101 with the finger, and confirms completion of input operation.

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CLAIMS

[Claim(s)]

[Claim 1] The input unit characterized by having the controller section which outputs the driving signal for driving said mechanical component by making into an input signal the detection signal which a keytop, the input detection section which detects the thrust of said keytop and outputs a detection signal, the mechanical component which vibrates said keytop, and said input detection section output.

[Claim 2] The input unit according to claim 1 with which said mechanical component consists of a piezoelectric device.

[Claim 3] The input unit according to claim 1 with which said mechanical component vibrates said keytop in the time amount by which thrust is impressed to said keytop at least.

[Claim 4] The input unit according to claim 1 said whose driving signal which said controller section outputs is a sine wave or a false sine wave.

[Claim 5] The input unit according to claim 1 with which said driving signal which said controller section outputs has a discontinuous pulse-like signal wave form.

[Claim 6] The input unit which detects the thrust of a keytop and said keytop and is characterized by to have the controller section which outputs the driving signal for driving said mechanical component by making into an input signal the input detection section which outputs the signal according to said thrust, the pressure detection section which changes and outputs the output signal of said input detection section to a predetermined signal, the mechanical component which vibrate said keytop, and the signal which said pressure detection section outputs.

[Claim 7] Said driving signal is a different input unit according to claim 8 according to the magnitude of said thrust.

[Claim 8] Said driving signal is an input unit according to claim 7 with which frequencies differ according to the magnitude of thrust.

[Claim 9] Said driving signal is an input unit according to claim 7 with which wave patterns differ according to the magnitude of thrust.

[Claim 10] Said driving signal is an input unit according to claim 7 with which amplitude differs according to the magnitude of thrust.

[Claim 11] The input unit characterized by to have the controller section which

outputs the driving signal for having two or more configuration units which consist of a keytop, the input detection section which detects the thrust of said keytop and outputs a detection signal, and a mechanical component which vibrates said keytop, and driving said corresponding mechanical component by making into an input signal the detection signal which said input detection section outputs.
[Claim 12] Said driving signal which said controller section outputs is a different input unit according to claim 11 for said every configuration unit.
[Claim 13] Said driving signal is an input unit according to claim 12 which is the sine wave which changed the frequency according to said configuration unit, a false sine wave, or a square wave.
[Claim 14] Said driving signal is an input unit according to claim 12 which has the signal wave form where the wave pattern was changed according to said configuration unit.
[Claim 15] Said driving signal is an input unit according to claim 12 which has the signal wave form where the amplitude was changed according to said configuration unit.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optimal input unit for switching equipment, such as a keyboard.
[0002]
[Description of the Prior Art] The outline configuration of the input devices, such as a keyboard, is conventionally carried out by housing, the switching device built in housing, the stem guided possible [rise and fall] to housing, the return spring which returns a stem, and the click device in which it operates by rise and fall of a stem.
[0003] If a return spring is resisted, and a stem is pressed and is dropped with a finger etc. on the occasion of use, while the click device which consists of a reversal spring etc. in the migration course will operate and causing click feeling, the traveling contact of a switching device will contact a stationary contact, and will be in a switch ON state. Moreover, if the above-mentioned thrust to a stem is removed, a stem goes up with a return spring, and a traveling contact will estrange it from a stationary contact in this migration course, and it will be turned off [switch].
[0004]
[Problem(s) to be Solved by the Invention] A notebook computer thin by small begins spread quickly, and the request of thin-shape-izing is large in recent years also on the keyboard which is an input device. However, in conventional switching

equipment, in order to operate a click function, even if the movement magnitude of a stem was large and made thickness of a stem or housing thin, the limitation was in thin shape-ization.

[0005] Moreover, membrane SUSUITCHI equipment using the flexible film as switching equipment aiming at thin-shape-izing is known. This carries out the laminating of the film and spacer film of a pair in which the electrode was formed on the front face, one by one, is constituted, and when an electrode connects with stress, it achieves a switch function. Since membrane SUSUITCHI equipment aimed at thin shape-ization to this appearance, and it was not able to check whether the movable amount was small, therefore the input has been ensured the operator with a feeling of a click etc. to press, it had the trouble that clear feedback was not obtained.

[0006] Moreover, the feedback signal for identifying not only an input check but an input key exists in the conventional thing, and is inside **. For this reason, it could not judge whether input operation was performed certainly, but displays, such as a display, were required only of the keyboard.

[0007] In view of the situation of the above-mentioned conventional technique, this invention aims at offering the input unit which can feed back that input operation was performed certainly, though it is a thin shape.

[0008]

[Means for Solving the Problem] In order to attain said purpose, the input unit of this invention is considered as the following configurations.

[0009] Namely, the input unit concerning the 1st configuration of this invention is characterized by having the controller section which outputs the driving signal for driving said mechanical component by making into an input signal the detection signal which a keytop, the input detection section which detects the thrust of said keytop and outputs a detection signal, the mechanical component which vibrates said keytop, and said input detection section output. According to this configuration, the thrust to a keytop with an operator's finger is changed into a detection signal by the input detection section, it is changed into a driving signal by the controller section, and a mechanical component vibrates a keytop by it. Consequently, an operator can check that the input operation by the keytop has been completed certainly by vibration sensed for a finger.

[0010] In the 1st above-mentioned configuration, it is desirable that said mechanical component vibrates said keytop in the time amount by which thrust is impressed to said keytop at least. Since according to this desirable configuration a mechanical component vibrates a keytop before an operator's finger leaves a keytop, an operator can sense check vibration of input operation through a finger at the time of a key input.

[0011] Moreover, the input unit concerning the 2nd configuration of this invention A keytop and the input detection section which detects the thrust of said keytop and outputs the signal according to said thrust, It is characterized by having the

controller section which outputs the driving signal for driving said mechanical component by making into an input signal the pressure detection section which changes and outputs the output signal of said input detection section to a predetermined signal, the mechanical component which vibrates said keytop, and the signal which said pressure detection section outputs. According to this configuration, the thrust to a keytop with an operator's finger is changed into the detection signal of an analog by the input detection section, and it is changed into a digital signal by the pressure detection section, and it is changed into a driving signal by the controller section, and a mechanical component vibrates a keytop by it. Consequently, an operator can check that the input operation by the keytop has been completed certainly by vibration sensed for a finger. Moreover, the configuration to which a driving signal is changed according to the magnitude of the thrust to a keytop can be taken easily. Furthermore, since the signal generated by the size of the thrust to a keytop changes, a different signal by changing the thrust to one keytop can be inputted.

[0012] As for said driving signal, in the 2nd above-mentioned configuration, differing according to the magnitude of said thrust is desirable. According to this desirable configuration, vibration which an operator senses for a finger changes according to thrust. Consequently, in addition to the ability to check that input operation has been completed certainly through a finger, an operator can check the magnitude (class of signal inputted when putting in another way) of the thrust inputted through the keytop.

[0013] Moreover, it carries out having had the controller section which outputs the driving signal for the input unit concerning the 3rd configuration of this invention having two or more configuration units which consist of a keytop, the input detection section which detects the thrust of said keytop and outputs a detection signal, and a mechanical component which vibrates said keytop, making an input signal the detection signal which said input detection section outputs, and driving said corresponding mechanical component as the description. According to this configuration, the thrust to a keytop with an operator's finger is changed into a detection signal by the corresponding input detection section, is changed into a driving signal by the controller section, and vibrates the keytop by which the mechanical component was pressed. Consequently, an operator can check that the input operation by the keytop has been completed certainly by vibration sensed for a finger.

[0014] As for said driving signal which said controller section outputs, in the 3rd above-mentioned configuration, differing for said every configuration unit is desirable. According to this desirable configuration, vibration which an operator senses for a finger changes for every keytop. Consequently, an operator can check which keytop has been pressed through a finger among the keytops which have more than one, without using display means, such as a display unit. Moreover, it can also be collectively checked by sensing vibration that input operation has been completed.

[0015]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.
[0016] (Gestalt of the 1st operation) The input unit concerning the gestalt of operation of the 1st of this invention is explained, referring to drawing 1 and drawing 2 .
[0017] Drawing 1 is the outline block diagram of the input unit concerning the gestalt of the 1st operation. For a keytop and 102, as for a mechanical component and 104, in this drawing, the input detection section and 103 are [101 / the controller section and 105] host computers.
[0018] A keytop 101 consists of members, such as a cast of synthetic resin, or a synthetic-resin film, and has the field which receives thrust with the finger of operators, such as a computer. The keytop 101 is constituted so that it may carry out movable in the vertical direction slightly by this thrust, and it transmits this motion to the input detection section 102.
[0019] The input detection section 102 is constituted using the membrane switch as usual. This carries out the laminating of the film and spacer film of a pair in which the electrode was formed on the front face, one by one, is constituted, and when an electrode connects with stress, it achieves a switch function. By using a membrane switch, thickness of an input unit can be made thin.
[0020] The mechanical component 103 is installed in the lower part of the input detection section 102. The mechanical component 103 consists of actuators which vibrate for example, in the vertical direction etc., and vibrates the input detection section 102 and the whole keytop 101.
[0021] Thus, in the constituted input unit, if operators, such as a computer, apply thrust to a keytop 101 with a finger, only a minute amount is displaced caudad and presses the input detection section 102, thereby, the input detection section 102 will judge a keytop 101 that the keytop 101 was pressed, and it will output the detection signal S1 to the controller section 104. The controller section 104 outputs a driving signal S2 to a mechanical component 103 while transmitting that the host computer 105 had an input from the keytop 101 corresponding to the detection signal S1 from the input detection section 102. A mechanical component 103 consists of moving parts containing an actuator, generates vibration with a driving signal S2, and vibrates the input detection section 102 and a keytop 101. Thereby, an operator can be told about key input actuation having been completed certainly.
[0022] Next, if an operator removes the thrust to a keytop 101, according to the stability of input detection section 102 the very thing, a keytop 101 will go up in the original location, and the input detection section 102 will detect that thrust was canceled. Thereby, the input detection section 102 outputs the detection signal S1 which shows an OFF state to the controller section 104. The controller section 104 stops a driving signal S2, and suspends vibration of a mechanical component 103.
[0023] Drawing 2 is the sectional view having shown the detail of the input unit

concerning the gestalt of the 1st operation.
[0024] The mechanical component 103 consists of the piezo electric crystal 201 which carried out the laminating of the electrodes 202a and 202b of a pair to the front flesh side, a metal plate 203, a mechanical-component case 204, and the oscillating transfer section 205. The configuration which can feed back input operation to an operator can be built easily, thin-shape-izing an input device by using a piezo electric crystal. moreover, by boiling various driving signals and changing them, the oscillation mode is changed and it can also make it easy to provide an operator with different information through a finger so that it may mention later.
[0025] Piezo electric crystals 201 are piezo electric crystals, such as piezo-electric ceramics, such as PZT, and polarization of the thickness is carried out in the thickness direction by 50 micrometers - 200 micrometers. Moreover, the laminating of the electrodes 202a and 202b of a pair is carried out to the front flesh side. A metal plate 203 is thickness with a thickness of 50 micrometers - 200 micrometers, and the almost same thickness as a piezo electric crystal is suitable. As an ingredient, spring material, such as iron system metals, such as stainless steel, and phosphor bronze, etc. is suitable. Both the piezo electric crystal 201 and the metal plate 203 may be circular, and although a rectangle is sufficient, even if it is which case, the shape of isomorphism a little with the smaller piezo electric crystal 201 is desirable. Electrode 202a is pasted up on a metal body 203 through adhesives, and while the laminating was carried out to the piezo electric crystal 201 is connected to a metal plate 203 mechanically and electrically. The metal plate 203 is being fixed to the mechanical-component case 204 through the glue line in the edge. Although the Plastic solid of resin or a metaled workpiece is sufficient as it, the mechanical-component case 204 has high rigidity, and if it is a disk about a metal plate 203 and it is a rectangle plate about a perimeter, it is desirable [the case] to fix four sides or two sides. Furthermore, the signal lines 206a and 206b from the external controller section 104 are connected to electrode 202b and the metal body 203 by which the laminating was carried out to one field of a piezo electric crystal 201, respectively. The driving signal from the controller section 104 is impressed as an electrical potential difference between a metal plate 203 and electrode 202b through signal lines 206a and 206b, and a piezo electric crystal 201 tends to carry out flexible movement in the direction of a field according to the electrical potential difference. Since a piezo electric crystal 201 and a metal plate 203 are pasted up and bimorph is constituted, it bends as a result, vibration occurs, and induction of the vertical vibration is carried out in the direction of the arrow head 207 in drawing 2 . The oscillating transfer section 205 transmits this vibration to the input detection section 102 and a keytop 101, and an operator can check that the key input has been certainly made by vibration. The oscillating transfer section 205 has a desirable high elasticity object so that vibration can be transmitted efficiently, and its thing which do not check bending vibration of bimorph and which is done for adhesion

immobilization is [like] desirable only in the very small field near the center section of a metal plate 203. Moreover, as for the oscillating transfer section 205, it is desirable to consist of ingredients with the high Young's modulus of a metal with small loss of oscillating transfer etc.

[0026] According to such a configuration, an operator can check that input operation has been completed certainly by a mechanical component's 103 vibrating according to the output signal of the input detection section 102 which detected thrust, and transmitting this vibration to an operator.

[0027] (2nd operation gestalt) The input unit concerning the gestalt of operation of the 2nd of this invention is explained, referring to drawing 3 -4.

[0028] Drawing 3 is a timing chart for explaining the drive approach of the mechanical component 103 of the input device of drawing 1 , and shows the relation between press actuation of a keytop 101, and the timing to which a mechanical component 103 vibrates. In drawing 3 , an axis of abscissa shows a time-axis.

[0029] The actuation which an operator presses a keytop 101 with a finger at time of day t1, cancels press at time of day t2, separates a finger from a keytop 101, and completes an input is taken for an example. In this case, the input detection section 102 outputs the detection signal S1 to the controller section 104 at time of day t3 after some time lag from time of day t1. The controller section 104 outputs a driving signal S2 to time of day t4 to a mechanical component 103 while transmitting an input detection signal to a host computer 105, after receiving this detection signal S1. Consequently, a mechanical component 103 generates vibration from time of day t5.

[0030] The time of day t5 when a mechanical component 103 generates vibration must be the time of day at least when a finger is earlier than the time of day t2 which leaves a keytop. That is, a mechanical component 103 must start vibration in the time amount (during time of day t1 to the time of day t2) to which an operator's finger is pressing the keytop. Thereby, an operator can sense check vibration of the key input having been completed through the finger.

[0031] The appropriate back, if an operator stops press at time of day t2, the detection signal S1 and a driving signal S2 will be in an OFF state one by one at time of day t6 and t7, and will also suspend vibration of a mechanical component 103 at time of day t8.

[0032] Drawing 4 (a) The wave-like example of the driving signal S2 which the controller section 104 outputs to - (c) is shown. In drawing 4 , an axis of abscissa shows a time-axis.

[0033] Since the mechanical component 103 consists of piezo electric crystals etc. as the gestalt of the 1st operation explained, the driving signal S2 for driving this must be an AC signal.

[0034] Drawing 4 (a) shows the continuous sine wave with a specific frequency. Since a big resonance vibration can be obtained by the low battery by the driving signal which consists of such a sine wave containing only the specific frequency

component, and setting up the frequency almost equally to the resonance frequency of a mechanical component, it can be made to drive very efficiently.
[0035] Drawing 4 (b) shows the continuous false sine wave which has a specific frequency as fundamental frequency. Also in this case, setting ****** is almost equally [to the resonance frequency of a mechanical component] desirable in that fundamental frequency. Thereby, vibration of the continuous big amplitude can be obtained. Although the effectiveness of a drive is inferior a little as compared with (a), a wave can be formed comparatively easily. Moreover, rather than the circuit which generates a sine wave, the circuit of effectiveness which generates a false sine wave is higher, and the false sine wave drive can also acquire high effectiveness synthetically.
[0036] Drawing 4 (c) shows the example which put in the square wave in the shape of a **** pulse. By driving by such square wave, a big output can be obtained effectually. As for the frequency of a square wave, it is desirable to set up a frequency almost equal to the resonance frequency of a mechanical component. Thereby, a continuous big vibration can be obtained. Furthermore, the square wave contains many higher modes of fundamental frequency. For example, in the 3rd mode, the 5th mode has 20% of basic amplitude 33% of the base. This high order vibration can excite the high order resonance mode of a mechanical component, and a consequent still bigger vibration can also be obtained. Moreover, by giving a square wave discontinuous in the shape of a pulse, the low frequency component specified with the period of a pulse is also contained, for a ** reason, the sensibility of human being's tactile feeling can increase a several Hz to hundreds of good Hz frequency component, and the vibration from a keytop is efficiently transmitted to an operator.
[0037] In addition, in a sinusoidal drive and a false sine wave drive, it cannot be overemphasized that the signal of **** instead of a continuous wave may be outputted intermittently, a mechanical component may be vibrated, and the same effectiveness is acquired also in this case.
[0038] (3rd operation gestalt) The input unit concerning the gestalt of operation of the 3rd of this invention is explained, referring to drawing 5 .
[0039] Drawing 5 is the outline block diagram of the input unit concerning the gestalt of the 3rd operation. In this drawing, the same sign is given to the gestalt of the 1st operation and the component which has the same function substantially shown in drawing 1 and drawing 2 , and detailed explanation is omitted.
[0040] For 501, as for the input detection section and 503, in this drawing, the pressure detection section and 502 are [a mechanical component and 504] the controller sections.
[0041] keytops 101 are few in the vertical direction -- it is constituted so that it may carry out movable, and this motion is transmitted to the input detection section 502. It consists of piezo electric crystals etc. and the input detection section 502 outputs the analog detection signal S11 corresponding to the magnitude of the thrust transmitted to the input detection section 502 from the keytop 101 to the

pressure detection section 501. For example, when a piezo electric crystal is used as the input detection section 502, if a big distortion occurs by big thrust, high output voltage will occur.

[0042] Next, the pressure detection section 501 outputs the digital detection signal S12 corresponding to thrust to the controller section 504, after performing digital processing of A/D conversion etc. for the analog detection signal S11 of the input detection section 502.

[0043] The controller section 504 outputs the driving signal S13 corresponding to input thrust to a mechanical component 503 while transmitting that the host computer 105 had an input from the keytop 101, and its input thrust corresponding to the detection signal S12 from the pressure detection section 501.

[0044] A mechanical component 503 consists of moving parts which contain an actuator like the gestalt of the 1st and the 2nd operation, generates vibration with a driving signal S13, and vibrates the input detection section 502 and a keytop 101. Thereby, an operator can be told about that the key input was completed certainly and an operator's input thrust.

[0045] Next, if an operator removes the thrust to a keytop 101, according to the stability of input detection section 502 the very thing, a keytop 101 will go up in the original location, and the input detection section 502 will detect that thrust was canceled. Thereby, the input detection section 502 outputs the analog detection signal S11 which shows an OFF state to the pressure detection section 501, and the pressure detection section 501 outputs a digital detection signal to the controller section 504, after carrying out digital processing of the input signal which shows that thrust was canceled. The controller section 504 suspends the output of the driving signal S13 to a mechanical component 503 while transmitting that the input was canceled of the keytop 101 by the host computer 105 corresponding to the detection signal from the pressure detection section 501. In response, vibration of a mechanical component 503 stops.

[0046] It is possible to input a signal which is different when an operator changes the thrust to the same keytop with such a configuration. Moreover, an operator can check what kind of signal has been inputted by transmitting the vibration according to the inputted signal to an operator.

[0047] (4th operation gestalt) The input unit concerning the gestalt of operation of the 4th of this invention is explained, referring to drawing 6 .

[0048] Drawing 6 is the wave form chart having shown the example of the detection signal S11 which the input detection section 502 outputs, and the driving signal S13 which the controller section 504 outputs according to it in the input unit of drawing 5 . In drawing 6 , an axis of abscissa shows a time-axis.

[0049] Since the mechanical component 503 consists of piezo electric crystals etc. as the gestalt of the 3rd operation explained, it is the same as that of the gestalt of the 2nd operation that it must be an AC signal of the driving signal S13 for driving this.

[0050] As shown in drawing 6 , the case where two press actuation P1 and P2 from which thrust differs is performed is considered. The input detection section 502 outputs the analog detection signal S11 which has electrical potential differences V1 and V2 different, respectively according to the magnitude of input thrust, as the gestalt of the 3rd operation explained. The pressure detection section 501 outputs the digital detection signal S12 according to this analog detection signal S11 to the controller section 504, and the controller section 504 outputs the driving signal S13 corresponding to an input signal S12 to a mechanical component 503.
[0051] Drawing 6 (a) shows the wave of the driving signal S13 which changed fundamental frequency corresponding to a different analog detection signal S11. For example, a detection signal with a frequency high [thrust is high, and] when the output value of the detection signal S11 is large is outputted. It is desirable to use dozens of Hz to hundreds of Hz with the high sensibility of people's feeling as a drive cycle. Thereby, the difference in a frequency can be sensed and input thrust can be checked. Moreover, if fundamental frequency is set up near the resonance frequency of a mechanical component 503, on a near frequency, an input impedance becomes small with resonance frequency, the power of a driving signal will become large and the magnitude of vibration will also become large. On the contrary, on a far frequency, an input impedance becomes large by ********, the power of a driving signal becomes small and the magnitude of vibration also becomes small. Therefore, an operator can check the inputted thrust by the difference in this vibration.
[0052] Moreover, although illustrated by the square wave all over drawing, it may not be what was restricted to this and you may be a sine wave and a false sine wave like the gestalt of the 2nd operation.
[0053] Drawing 6 (b) shows the wave of the driving signal S13 which changed the output wave pattern corresponding to a different analog detection signal S11. Although the case where the fundamental-wave form which constitutes an output wave by a diagram is a square wave is illustrated, even if it is a sine wave and a false sine wave, the same thing is the same as that of the example of (a). By this example, it is considering as the driving signal S13 combining the fundamental-wave form with the same amplitude on the same frequency (period). An operator can check the inputted thrust by changing an oscillating pattern like [it considers as the continuous wave form finished for a short time to the 1st press actuation by this, and] an intermittent drive wave to the 2nd press actuation.
[0054] Drawing 6 (c) shows the wave of the driving signal S13 which changed the amplitude corresponding to a different analog detection signal S11. If the seal of approval of the driving signal of the big amplitude is carried out to a mechanical component 503, since a mechanical component will vibrate with the bigger amplitude depending on the amplitude of a driving signal, the output vibration corresponding to input thrust will be obtained. Although illustrated by the square wave all over drawing, it may not be what was restricted to this and you may be a sine wave and a false sine wave like the gestalt of the 2nd operation.

[0055] Thus, since vibration is distinguishable by changing the frequency of a driving signal, the pattern of a drive wave, and a voltage swing according to the magnitude of input thrust, an operator can check input thrust from the difference in vibration. That is, the difference in the signal inputted through the difference in vibration can be checked.

[0056] (5th operation gestalt) The input unit concerning the gestalt of operation of the 5th of this invention is explained, referring to drawing 7 .

[0057] Drawing 7 is the outline block diagram of the input unit concerning the gestalt of the 5th operation. In this drawing, 704 is the Comte Lara section and 705 is a host computer. In this drawing, the same sign is given to the gestalt of the 1st operation and the component which has the same function substantially shown in drawing 1 and drawing 2 , and detailed explanation is omitted.

[0058] The input unit of the gestalt of this operation has two or more configuration units which consist of a keytop 101, the input detection section 102, and a mechanical component 103. The concrete configuration and actuation of a keytop 101, the input detection section 102, and a mechanical component 103 are substantially [as the gestalt of the 1st operation] the same.

[0059] Direct continuation of each configuration unit is carried out to the controller section 704. That is, the detection signal S1 from the input detection section 102 of each configuration unit is outputted to the controller section 704. Moreover, the controller section 704 outputs a driving signal S2 to the mechanical component 103 corresponding to the input detection section 102 which outputted the detection signal S1 concerned while transmitting that the host computer 705 had an input from the specific keytop 101 corresponding to the detection signal S1 from the input detection section 102.

[0060] In the constituted input unit operators, such as a computer, with a finger Thus, one specific keytop in two or more keytops If the thrust (which calls this "the 1st keytop", gives the "1st" qualification to each component of the configuration unit corresponding to this hereafter, and is distinguished from the component of other configuration units) is applied The 1st keytop presses the 1st input detection section which displaces and corresponds to a minute amount lower part, and thereby, the 1st input detection section judges that the 1st keytop was pressed, and outputs the 1st detection signal S1 to the controller section 704.

[0061] The controller section 704 outputs the 1st driving signal S2 to the 1st mechanical component while transmitting that the host computer 705 had an input from the 1st keytop corresponding to the 1st detection signal S1 from the 1st input detection section. The 1st mechanical component generates vibration with the 1st driving signal S2, and vibrates the 1st input detection section and 1st keytop. Thereby, an operator can be told about the key input actuation by the 1st keytop having been completed certainly.

[0062] Next, if an operator removes the thrust to the 1st keytop, according to the stability of the 1st input detection section itself, the 1st keytop will go up in the

original location, and the 1st input detection section will detect that thrust was canceled. Thereby, the 1st input detection section outputs the 1st detection signal S1 which shows an OFF state to the controller section 704. Based on this, the controller section 704 suspends the output of the 1st driving signal S2, and suspends vibration of the 1st mechanical component.

[0063] Next, the keytop in which an operator differs thrust from the 1st keytop with a finger If this is called "2nd keytop", the "2nd" qualification is hereafter given to each component of the configuration unit corresponding to this and it adds (in distinction from the component of other configuration units) Pressing the 2nd input detection section which displaces and corresponds to a minute amount lower part like the 1st keytop, thereby, the 2nd input detection section judges that the 2nd keytop was pressed, and outputs the 2nd detection signal S1 to the controller section 704.

[0064] The controller section 704 outputs the 2nd driving signal S2 to the 2nd mechanical component while transmitting that the host computer 705 had an input from the 2nd keytop corresponding to the 2nd detection signal S1 from the 2nd input detection section. The 2nd mechanical component generates vibration with the 2nd driving signal S2, and vibrates the 2nd input detection section and 2nd keytop. Thereby, an operator can be told about the key input actuation by the 2nd keytop having been completed certainly.

[0065] Finally, if an operator removes the thrust to the 2nd keytop, according to the stability of the 2nd input detection section itself, the 2nd keytop will go up in the original location, and the 2nd input detection section will detect that thrust was canceled. Thereby, the 2nd input detection section outputs the 2nd detection signal S1 which shows an OFF state to the controller section 704. Based on this, the controller section 704 suspends the output of the 2nd driving signal S2, and suspends vibration of the 2nd mechanical component.

[0066] Here, a different wave-like signal from the 1st driving signal outputted to the 1st mechanical component and the 2nd driving signal outputted to the 2nd mechanical component is used. That is, a different driving signal corresponding to each keytop is outputted, and each mechanical component vibrates by the oscillatory-type voice of a proper respectively corresponding to each driving signal. Consequently, an operator can check which keytop has been pressed down by concerning that different oscillatory-type voice with a finger, without using display means, such as a display.

[0067] The approach of changing a wave like shown with the gestalt of the 4th operation of the above-mentioned as the approach of distinction of the driving signal outputted to each mechanical component is suitable.

[0068] That is, corresponding to each keytop, it can consider as the sine wave, false sine wave, or square wave which changed the frequency.

[0069] Moreover, corresponding to each keytop, it can also consider as the discontinuous pulse-like signal wave form where the wave pattern was changed.

[0070] Moreover, corresponding to each keytop, it can also consider as a signal wave form with different amplitude.
[0071] Or a driving signal may be distinguished, combining these driving signals suitably.
[0072] According to the gestalt of this operation, it can check which keytop the operator has pressed down by changing the oscillating pattern of two or more keytops, respectively, without using display means, such as a display.
[0073] In addition, although the above-mentioned explanation showed the configuration which has two or more configuration units which consist of the keytop 101 of the gestalt (drawing 1) of the 1st operation, the input detection section 102, and a mechanical component 103, it can also consider as the configuration which has two or more configuration units which consist of the keytop 101 of the gestalt (drawing 5) of the 3rd operation, the input detection section 502, and a mechanical component 503. In this case, the pressure detection section can also be prepared in each one configuration unit of every, and can also be prepared only one to two or more configuration units. According to such a configuration, in addition to the information about which keytop was pressed, an operator also combines the information about the inputted thrust, and he can check with a finger, without using display means, such as a display.
[0074]
[Effect of the Invention] As mentioned above, according to the 1st configuration of this invention, the thrust to a keytop with an operator's finger is changed into a detection signal by the input detection section, it is changed into a driving signal by the controller section, and a mechanical component vibrates a keytop by it. Consequently, an operator can check that the input operation by the keytop has been completed certainly by vibration sensed for a finger.
[0075] Moreover, according to the 2nd configuration of this invention, the thrust to a keytop with an operator's finger is changed into the detection signal of an analog by the input detection section, and it is changed into a digital signal by the pressure detection section, and it is changed into a driving signal by the controller section, and a mechanical component vibrates a keytop by it. Consequently, an operator can check that the input operation by the keytop has been completed certainly by vibration sensed for a finger. Moreover, the configuration to which a driving signal is changed according to the magnitude of the thrust to a keytop can be taken easily. Furthermore, since the signal generated by the size of the thrust to a keytop changes, a different signal by changing the thrust to one keytop can be inputted.
[0076] Moreover, according to the 3rd configuration of this invention, the thrust to a keytop with an operator's finger is changed into a detection signal by the corresponding input detection section, is changed into a driving signal by the controller section, and vibrates the keytop by which the mechanical component was pressed. Consequently, an operator can check that the input operation by the keytop has been completed certainly by vibration sensed for a finger. Since vibration

whose operator senses for a finger the driving signal which the controller section outputs by making it differ for every configuration unit at this time changes for every keytop, an operator can check which keytop has been pressed through a finger among the keytops which have more than one, without using display means, such as a display unit.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The outline block diagram of the input unit concerning the gestalt of operation of the 1st of this invention
[Drawing 2] The sectional view of the input unit concerning the gestalt of operation of the 1st of this invention
[Drawing 3] The timing chart which showed the drive approach of the mechanical component of the input device concerning the gestalt of operation of the 2nd of this invention
[Drawing 4] The wave form chart of the driving signal which the controller section of the input unit concerning the gestalt of operation of the 2nd of this invention outputs
[Drawing 5] The outline block diagram of the input unit concerning the gestalt of operation of the 3rd of this invention
[Drawing 6] The wave form chart of the driving signal which the controller section of the input unit concerning the gestalt of operation of the 4th of this invention outputs
[Drawing 7] The outline block diagram of the input unit concerning the gestalt of operation of the 5th of this invention
[Description of Notations]
101: Keytop
102: Input detection section
103: Mechanical component
104: Controller section
105: Host computer
201: Piezo electric crystal
202a, 202b: Electrode
203: Metal plate
204: Mechanical-component case
205: Oscillating transfer section
501: Pressure detection section
502: Input detection section
503: Mechanical component

504: Controller section
704: Controller ****
705: Host computer